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 IMPLEMENTING AN IMAGE
 ANCILLARY TO A CURSOR
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1. Our checks in the amount of \$1,878.00 and \$40.00
2. Fee Calculation Sheet (in duplicate)
3. Patent Application comprising the following pages:
 - 1 Abstract
 - 24 Specification
 - 12 Claims
4. 8 Sheets of drawings
5. Executed Declaration and Power of Attorney (3 pages)
6. Executed Assignment and Recordation Form Cover Sheet

Under 37 CFR § 1.136(a)(3), applicant(s) hereby authorize(s) for any future reply, the incorporation of any required petition for extension of time for the appropriate length of time and authorize the charging of fees under § 1.17 to deposit account 23-1123.

Respectfully submitted,

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PATENT APPLICATION OF

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ENTITLED

SYSTEM AND METHOD FOR IMPLEMENTING AN IMAGE
ANCILLARY TO A CURSOR

Docket No. M61.12-0177

REFERENCE TO RELATED APPLICATION

BACKGROUND OF THE INVENTION

A conventional mouse also typically includes one or more actuator buttons. The actuator buttons are typically actuable by the operator by simply depressing the selected button. Actuation of the buttons can implement a number of different features. For example, where the user has acquired a target (e.g., an icon), by placing the mouse cursor over the

icon on the visual display screen, the user may typically be able to select the feature or program represented by that icon by simply depressing one of the actuator buttons after the target has been
5 acquired.

In one conventional system, the cursor is associated with an arrow, or other visible display element which moves about the screen. The cursor display element or display image is conventionally
10 treated the same as any other object on the display screen, from a depth perception standpoint. Therefore, when the display screen is displaying a large number of icons, windows, or other display elements, the cursor can be difficult to locate and
15 follow during operation.

SUMMARY OF THE INVENTION

A system and method display in ancillary image which is movable with a cursor image. A cursor image indication is obtained which is indicative of the
20 cursor image. An ancillary image indication is generated based on the cursor image indication. The cursor image and the ancillary image are displayed based on the cursor image indication and the ancillary image indication.

25 In one illustrative embodiment, the ancillary image is a shadow cast by the cursor image. Therefore, while the cursor image is opaque, the ancillary image is translucent. Of course, the ancillary image can take any other of a wide variety
30 of forms, some of which are discussed below. However, the ancillary image is movable along with the cursor during operation.

FIG. 1 is a block diagram of an exemplary environment for implementing the present invention.

FIG. 3 is a flow diagram illustrating creation and display of the ancillary image in accordance with one embodiment of the present invention.

FIGS. 4B-4D illustrate the creation of an ancillary image as described with respect to FIG. 4A in accordance with one embodiment of the present invention.

FIGS. 5B and 5C illustrate the creation of the ancillary image as described with respect to FIG. 5A.

FIG. 6B illustrates the creation of the ALPHA and SHADOW-masks as described with respect to FIG. 6A.

FIGS. 8A-8C illustrate alternate embodiments of ancillary images in accordance with further aspects of

the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Overview

5 In one embodiment, the present invention is a method, apparatus and display which enables cursor shapes or images to be displayed with shadows. In another embodiment, the present invention is a method, apparatus and display which enables cursor shapes or images to be specified or represented by an alpha, red, green, blue (ARGB) bitmap image. In one
10 embodiment, the present invention provides an image ancillary to a cursor image. FIG. 1 and the related discussion are intended to provide a brief, general description of a suitable computing environment in which the invention may be implemented.

15 Although not required, the invention will be described, at least in part, in the general context of computer-executable instructions, such as program modules, being executed by a personal computer or other computing device. Generally, program modules
20 include routine programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system
25 configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, palmtop computers and the like. The invention is also applicable in
30 distributed computing environments where tasks are performed by remote processing devices that are linked

With reference to FIG. 1, an exemplary environment for the invention includes a general purpose computing device in the form of a conventional personal computer 20, including processing unit 21, a system memory 22, and a system bus 23 that couples various system components including the system memory to the processing unit 21. The system bus 23 may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory includes read only memory (ROM) 24 a random access memory (RAM) 25. A basic input/output 26 (BIOS), containing the basic routine that helps to transfer information between elements within the personal computer 20, such as during start-up, is stored in ROM 24. The personal computer 20 further includes a hard disk drive 27 for reading from and writing to a hard disk (not shown), a magnetic disk drive 28 for reading from or writing to removable magnetic disk 29, and an optical disk drive 30 for reading from or writing to a removable optical disk 31 such as a CD ROM or other optical media. The hard disk drive 27, magnetic disk drive 28, and optical disk drive 30 are connected to the system bus 23 by a hard disk drive interface 32, magnetic disk drive interface 33, and an optical drive interface 34, respectively. The drives and the associated computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program

modules and other data for the personal computer 20.

Although the exemplary environment described herein employs a hard disk, a removable magnetic disk 29 and a removable optical disk 31, it should be appreciated by those skilled in the art that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memory (RAM), read only memory (ROM), and the like, may also be used in the exemplary operating environment.

A number of program modules may be stored on the hard disk, magnetic disk 29, optical disk 31, ROM 24 or RAM 25, including an operating system 35, one or more application programs 36, other program modules 37, and program data 38. A user may enter commands and information into the personal computer 20 through input devices such as a keyboard 40 and pointing device (or mouse) 42. Other input devices (not shown) may include a touch pad, roller ball, microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit 21 through one of a plurality of ports. For instance, keyboard 40 is connected through a keyboard port 45, and mouse 42 is connected through serial port interface 46 but could also be connected through a MousePort or a PS/2 port.

In the illustrative embodiment, keyboard port 45 and serial port interface 46 are coupled to the system bus 23. User input devices may also be connected by other interfaces, such as a sound card, a parallel port, a game port or a universal serial bus (USB). A monitor

47 or other type of display device is also connected to the system bus 23 via an interface, such as a video adapter 48 controlled by a graphics engine either integrated with or located separately from operating system 35. Of course, the display can be provided on a CRT or any other type of display device, such as plasma display, an LED or LCD device, as examples. In addition to the monitor 47, personal computers may typically include other peripheral output devices such as a speaker and printers (not shown).

The personal computer 20 may operate in a networked environment using logic connections to one or more remote computers, such as a remote computer 49. The remote computer 49 may be another personal computer, a server, a router, a network PC, a peer device or other network node, and typically includes many or all of the elements described above relative to the personal computer 20, although only a memory storage device 50 has been illustrated in FIG. 1. The logic connections depicted in FIG. 1 include a local area network (LAN) 51 and a wide area network (WAN) 52. Such networking environments are commonplace in offices, enterprise-wide computer network intranets and the Internet.

When used in a LAN networking environment, the personal computer 20 is connected to the local area network 51 through a network interface or adapter 53. When used in a WAN networking environment, the personal computer 20 typically includes a modem 54 or other means for establishing communications over the wide area network 52, such as the Internet. The modem 54, which may be internal or external, is connected to

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FIG. 3 is a flow diagram illustrating one embodiment of the formation and display of the ancillary image 206 along with opaque portion 204 of cursor image 202. It should again be noted that creation of an alpha blended ARGB bitmap cursor image can be directly specified by an application and need not have an ancillary image per se, but simply be a composite image incorporating per pixel alpha and color values. FIG. 3 describes but one embodiment of generation of an ARGB bitmap cursor image, and also includes an ancillary image which is based on the cursor image.

First, an indication of the cursor image is
30 obtained. This is indicated by block 212 in FIG. 3.
The image of the cursor can be a bitmap or other
similar indication which illustrates cursor image 202.

Next, based on the opaque portions of cursor image 202, the ancillary image 206 is created. This is indicated by block 214. In an embodiment in which ancillary image 206 is a shadow, the opaque portion 204 of cursor image 202 can simply be augmented with an offset and translucency value in order to obtain the ancillary image. This is described in greater detail below. Next, the opaque portion of the cursor and the ancillary image are both displayed on the display screen. This is indicated by block 216.

FIG. 4A illustrates the creation and display of an ancillary image in greater detail. FIGS. 4B-4D illustrate portions of cursor image 200 during the creation and display of the ancillary image 206 and opaque portion 204.

Most cursor images 202 have an associated AND-mask. The AND-mask is a monochrome bitmap of the same dimensions as the bitmap defining the cursor image. In the associated AND-mask, each bit defines whether the corresponding pixel in the cursor image is visible or non-visible. For example, FIG. 4B illustrates an AND-mask 220 for the cursor image 202 shown in FIG. 2. The bits within arrow 222 (which corresponds to the opaque portion 204 of cursor image 202) are given a value of zero, which means those pixels are visible. The bits residing within AND-mask 220, but outside of arrow 222 (i.e., which correspond to the invisible pixels of cursor image 202 - ignoring the ancillary image 206 for now) are given a value of 1 which indicate that the corresponding pixels are invisible. In any case, the cursor AND-mask is first obtained. This is indicated by block 224 in FIG. 4A.

Next, in one illustrative embodiment, an ALPHA-mask (which illustratively includes both alpha and color channel information) is obtained. This is described in greater detail below. Briefly, however, the AND-mask 220 is expanded and each invisible bit (bit value 1 on the AND-mask) is mapped to a value of zero, while each visible bit (bit value zero on the AND-mask) is mapped to a non-zero value. Creating the ALPHA-mask is illustrated by block 226 in FIG. 4A.

10 The ALPHA-mask is illustrated by figure 228 in FIG. 4C. ALPHA-mask 228 contains a silhouette of the cursor 222 shown in AND-mask 220 of FIG. 4B. Thus, in one embodiment, the ALPHA-mask is simply blended to the screen, and the cursor is drawn on top of the ALPHA-mask. This is shown by numeral 230 in FIG. 4D, and is illustrated by blocks 232 and 234 in FIG. 4A. Blending the images to the screen can also be combined into a single step, and is discussed in greater detail below.

20 While the ALPHA-mask can be used to generate the ancillary image (in this case a shadow), the ALPHA-mask has very sharply defined edges. This may not be the most aesthetically pleasing embodiment.

To create a more realistic looking ancillary image (e.g., a shadow), the edges of the ALPHA-mask can be softened. This is illustrated in greater detail in FIGS. 5A-5C. FIG. 5A is a flow diagram illustrating further steps which can be used to create a more aesthetically desirable ancillary image. FIGS. 5B and 5C illustrate such images.

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The first portion of FIG. 5A is similar to that shown in FIG. 4A, and is similarly numbered.

Therefore, the cursor AND-mask is first obtained as illustrated in block 224, and the ALPHA-mask is created as illustrated in block 226. As discussed above, the creation of the ALPHA-mask is discussed in greater detail below with respect to FIGS. 6A-6B.

However, in the embodiment illustrated in FIGS. 5A-5C, once the ALPHA-mask is obtained, it is softened to obtain a shadow mask. In one illustrative embodiment, the ALPHA-mask is filtered by a convolution filter, or another similar filter (such as an averaging filter) to soften its edges.

In one illustrative embodiment, the ALPHA-mask is filtered twice with a three by three (box car) convolution filter which is well known in the art. Briefly, each resulting pixel value is computed as the average of the corresponding source pixel and its eight closest neighboring pixels. The contributing pixels form a three by three array of pixels centered around the corresponding source pixel. This type of filter has a blurring effect. Because the ALPHA-mask is subjected to the filtering operation twice, the resultant shadow image now contains an interior portion (or umbra) 236 shown in FIG. 5B, and an exterior portion (or penumbra) 238. The interior portion 236 is darker while the exterior portion 238 is more translucent. Of course, at this point, the pixels outside of the shadow have an alpha value of zero and the soft edges have a value somewhere between zero and one. This will be referred to hereinafter as the SHADOW-mask. Softening the ALPHA-mask to obtain the SHADOW-mask is illustrated by block 240 in FIG. 5A.

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In addition, when the ancillary image is a shadow, it must be offset from the primary image of the cursor. Of course, the offset value can be predetermined or dynamically variable. Therefore, when the cursor AND-mask is expanded to the 32 bit per pixel bitmap, the pixels are positioned within the expanded bitmap, shifted by a desired vertical and horizontal offset value. FIG. 6B illustrates the original AND-mask 300 for a cursor image which is expanded into the ALPHA-mask 302. It can be seen that, in the embodiment illustrated in FIG. 6B, the ALPHA-mask is formed by providing an extra border around the AND-mask, and shifting the AND-mask downwardly and to the right, within the ALPHA-mask 302. Obtaining an offset value is indicated by block 306 in FIG. 6A, and shifting the translated AND-mask image by the offset value to relocate the ancillary image to a desired position (i.e., to obtain the ALPHA-mask) is illustrated by block 308 in FIG. 6A.

25 Once the SHADOW-mask has been obtained, the
cursor image and the SHADOW-mask can be blended to the
computer display in one of a wide variety of different
ways. In one illustrative embodiment, an alpha
blending function is performed using an application
30 programming interface (API) known as the AlphaBlend
supported by the WIN32 API set provided by Microsoft
Corporation of Redmond, Washington. Many different

types of alpha compositing operations can be performed to accomplish this. However, in one illustrative embodiment, a simple "source over" operation is used. In this type of compositing operation, each resulting
5 pixel displayed is a function of a source, a current destination, and an alpha value associated with the source as follows:

000000 "000000"

Equation 1

$$\text{Result} = (\text{source} * \alpha) + (1 - \alpha) * \text{destination}$$

where the source color is the color of the shadow
5 (e.g., black) and the destination is the image on the
computer screen which will reside under the image
being blended to the computer screen. The areas
outside of the shadow and cursor have an alpha value
of zero. Therefore, it can be seen from Equation 1
10 that the resulting pixels will be unmodified. The
umbra portion of the SHADOW-mask has the highest alpha
value, so those portions of the screen will have more
black blended into the resulting pixels. The areas
with an intermediate alpha value (the penumbras) will
15 have somewhat less black blended into the resulting
pixel values.

This source over function is applied to each of the color channels as follows:

Equation 2

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$$\text{Result}_r = (\text{source}_r * \alpha) + (1-\alpha) * \text{destination}_r$$

Equation 3

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25 Resultg = (sourceg * alpha) + (1-alpha) * destinationg
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Equation 4

$$\text{Result}_b = (\text{source}_b * \alpha) + (1-\alpha) * \text{destination}_b$$

Subscript r designates the red channel, the subscript g designates the green channel and the

subscript b designates the blue channel. Therefore, $source_r$ corresponds to the red value for the pixel while $source_g$ and $source_b$ correspond to the green and blue source values for that pixel, respectively.

5 The shadow can be alpha blended to the screen first and the cursor drawn on top of the blended shadow. Alternatively, the cursor and shadow can be combined into a composite image and blended to the screen in a single step.

10 Further, the alpha values can be pre-multiplied
against the source values. Therefore, instead of
storing each pixel value as (r, g, b, a), the alpha
values can be premultiplied against the red, green,
and blue source values such that the values stored are
15 (a*r, a*g, a*b, a). This is advantageous because the
"source over" operation described earlier requires
these values when computing the resulting pixel.

In any case, the combined cursor and shadow image will contain completely opaque cursor pixels (which have an alpha value of one), translucent umbra and penumbra pixels (which have an alpha value between zero and one), and completely transparent pixels that are neither in the cursor nor the shadow (which have an alpha value of zero). The combined image can then be AlphaBlended to the screen in a single step using the AlphaBlend API set.

FIG. 7 is a flow diagram illustrating how certain APIs can be used to accomplish the "source over" operation. Before discussing FIG. 7, it is first worth mentioning a number of terms used below. The AlphaBlend function is a function which displays bitmaps that have transparent or semitransparent

5 The term BitBlt refers to a function which transfers pixels from a specified source rectangle to a specified destination rectangle, altering the pixels according to a selected raster operation code. The supported raster operation codes include the SRCAND
10 code which combines the colors of the source and destination rectangles by using the BOOLEAN AND operator. The SRCPAINT code combines the colors of the source and destination rectangles using the BOOLEAN OR operator.

With this background, FIG. 7 can now be discussed. While FIG. 7 proceeds with respect to the above-described functions and APIs, it will be appreciated that this is for illustrative purposes only, and any other desired mechanism can be used to generate a composite image. Once the SHADOW-mask has been created as described above with respect to FIG. 6A, the graphics engine performs an SRCAND function of the cursor AND-mask into the SHADOW-mask. The palette is set so that the AND-mask pixel values of zero are treated as the color transparent black (the (alpha, red, green, blue) values are (0.0, 0.0, 0.0, 0.0)) and the pixel values of one are treated as the color opaque white (the alpha, red, green, blue) values are (1.0, 1.0, 1.0, 1.0)). This combines the SHADOW-mask

with the AND-mask using a logical AND function, which essentially cuts a hole in the SHADOW-mask for the opaque cursor image. In other words, where the AND-mask is visible (having a pixel value of zero), the SRCAND function results in zero, and where the AND-mask is invisible (having a pixel value of one), the SRCAND function results in the shadow remaining unchanged. This is indicated by block 320 in FIG. 7.

Next, the hole for the opaque cursor pixels is set to an alpha value of one in the SHADOW-mask by performing an SRCPAINT function of the cursor AND-mask into the SHADOW-mask. The palette is set so that the AND-mask pixel values of zero are treated as the color opaque black (the (alpha, red, green, blue) values (1.0, 1.0, 1.0, 1.0)) and the pixel values of one are treated as the color transparent black (the (alpha, red, green, blue) values are (0.0, 0.0, 0.0, 0.0)). This is indicated by block 322 in FIG. 7.

Finally, the graphics engine performs an SRCPAINT of the cursor image into the SHADOW-mask. This combines the cursor image with the SHADOW-mask using the logical OR operator to plug the cursor image into the hole left for it in the SHADOW-mask. This is indicated by block 324 in FIG. 7. It should also be noted that the composite image can be created by blending to a temporary bitmap and than simply copying the contents of the temporary bitmap to the display screen.

Of course, as discussed above, when an application is directly specifying the cursor image, it can specify the cursor image as an alpha blended ARGB image. If the cursor image is to include an

ancillary image, the application can derive its own "ancillary" image and combine that image with the original cursor image. In addition, the application can do many other things, such as provide an artist-rendered ARGB bitmap which includes an artist-rendered shadow, specify alpha values such that the cursor image is anti-aliased with no shadow, specify combined alpha and color channels to provide substantially any desired affect (such as a glow or halo around the cursor image, translucent smoke emanating from the cursor image, etc).

FIGS. 8A-8C illustrate a number of additional embodiments of the present invention. FIG. 8A illustrates that the ancillary image (in the embodiment illustrated, it is a shadow) need not have a static offset relative to the primary or cursor image. For instance, if the ancillary image is indeed a shadow, and the simulated point light source is fixed in the center of the screen, the shadow will be cast in a different direction depending on the position of the cursor image on the screen, relative to the simulated point light source. For example, if the point light source is positioned at a central top portion 400 of the screen illustrated in FIG. 8A, and the cursor is located at position 402, the ancillary image will be located downwardly and to the left of the cursor image (i.e., the shadow will be cast in a direction away from the point light source). Similarly, if the cursor is placed in position 404, the shadow will be cast substantially straight downwardly from the cursor image on the screen. Also, if the cursor is placed at position 406, the shadow

will be offset downwardly and to the right of the cursor image. Of course, there need not be any visual display of the simulated point light source. This source is simply simulated based on how the shadow is
5 cast.

Other embodiments are contemplated as well. For example, rather than having a fixed point light source, the point light source can emulate the sun, and can thus move from east to west (e.g., right to
10 left) across the screen based on the time of day. In that case, the position of the shadow will change depending on the current position of the point light source and the current position of the cursor relative to the point light source. Also, of course, rather
15 than being located at a central top region, the light source can be located at substantially any position on or off the screen such that the shadow will move about the cursor image based on its position relative to the point light source.

FIG. 8B illustrates yet another illustrative embodiment of the present invention. FIG. 8B illustrates the cursor placed at position 408 with respect to a display screen that is also displaying a window or icon 410. When the cursor is moved over the
20 window or icon 410, the ancillary image (in the embodiment in which it is a shadow) is cast in the normal fashion. However, when the user depresses a mouse button (such as to acquire the target over which it is drifting) the cursor moves in the direction
25 indicated by arrows 412. That is, in response to a mouse click, a message hook procedure executes to move the cursor image to where the shadow image had just
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a red tint after light has passed through the red cursor image.

Similarly, the ancillary image can be one which reflects a simulated property of the cursor. In other words, if the cursor is displayed to look like a water droplet, the ancillary image can be a wavy shadow or image which gives the appearance of light impinging on a surface after it has traveled through water. In the illustrative embodiment, the ancillary image simply moves with the cursor image and is based on some characteristic or property of the cursor image.

It can thus be seen that one illustrative embodiment of the present invention provides a cursor with a shadow. This can be accomplished in any number of ways, such as by simply displaying or rendering a cursor which includes a shadow as a part of its image, or by obtaining information indicative of the cursor image and deriving the shadow based on the cursor information. Similarly, when the cursor and shadow are separately obtained or derived, they can be separately rendered on the display, or rendered as a composite image.

Other illustrative embodiments of the present invention include methods, displays and apparatus which provide cursor and associated ancillary images as ARGB bitmaps. The ancillary images can exhibit a wide variety of characteristics.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

1. A method of di

1. A method of displaying a cursor, comprising:
obtaining a cursor image indication, indicative
of a cursor image;
obtaining an ancillary image indication,
indicative of an ancillary image, based on
the cursor image indication; and
displaying the cursor image and the ancillary
image based on the cursor image indication
and the ancillary image indication, a
location at which the ancillary image is
displayed being based on a location at which
the cursor image is displayed.
2. The method of claim 1 and further comprising:
forming a composite image indication indicative
of a composite image containing both the
cursor image and the ancillary image and
wherein the displaying step comprises
displaying the composite image.
3. The method of claim 1 wherein obtaining a cursor
indication comprises:
obtaining a cursor AND-mask.
4. The method of claim 3 wherein obtaining an
ancillary image indication comprises:
obtaining an ALPHA-mask based on the cursor AND-
mask.
5. The method of claim 4 wherein the cursor AND-mask

6. The method of claim 5 wherein obtaining an ALPHA-mask comprises:

7. The method of claim 6 wherein repositioning comprises:

8. The method of claim 6 wherein the repositioning step comprises:

9. The method of claim 8 wherein obtaining the desired offset value comprises:

obtaining the desired offset value based on a displayed position of the cursor image.

obtaining the desired offset value based on a displayed position of the cursor image and a time of day.

obtaining the desired offset value based on data associated with an image underlying a displayed position of the cursor image.

obtaining the desired offset value based on an operator input from a pointing device.

obtaining the desired offset value based on a size dimension of the cursor image.

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blending the ancillary image to a display screen
    based on the ALPHA-mask; and
blending the cursor image to the display screen
    based on the cursor AND-mask.

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15. The method of claim 14 wherein blending the ancillary image and blending the cursor image are

16. The method of claim 14 wherein blending the ancillary image and blending the cursor image each comprise:

17. The method of claim 4 wherein the displaying step comprises:

18. The method of claim 4 and further comprising:
softening the ALPHA-mask.

filtering the ALPHA-mask with an averaging filter
a desired number of times.

20. The method of claim 19 wherein the desired number of times is based on data associated with an image underlying a displayed position of the cursor image.

22. The method of claim 1 wherein the ancillary image appears as an image formed by light impinging on a surface after passing through the cursor image.

22. The method of claim 1 wherein the ancillary image appears as an image formed by light impinging on a surface after passing through the cursor image.

24. The computer system of claim 23 wherein the controller is configured to display the ancillary image as a shadow of the cursor image.

25. The computer system of claim 23 wherein the controller is configured to display the ancillary image as an image formed by light impinging on a surface after passing through the cursor image.

a cursor image displayed on the display device based on a user input; and
an ancillary image displayed on the display device at a position based on a position of the cursor image and having an appearance based on an appearance characteristic of the cursor image.

28. The display of claim 26 wherein the ancillary image appears as an image formed by light impinging on a surface after passing through the cursor image.

29. A computer readable medium containing instructions which, when executed by a computer cause the computer to perform steps of:

- obtaining a cursor image indication, indicative of a cursor image;
- obtaining an ancillary image indication, indicative of an ancillary image, based on the cursor image indication; and
- displaying the cursor image and the ancillary image based on the cursor image indication and the ancillary image indication, a location at which the ancillary image is displayed being based on a location at which the cursor image is displayed.

forming a composite image indication indicative of a composite image containing both the cursor image and the ancillary image and wherein the displaying step comprises displaying the composite image.

obtaining a cursor AND-mask.

obtaining an ALPHA-mask based on the cursor AND-mask.

enlarging the AND-mask to include a border;
translating values in the AND-mask bitmap from
visible values corresponding to a visible
portion of the cursor image to translucent
values; and
repositioning the translucent values within the

35. The computer readable medium of claim 34 wherein repositioning comprises:

36. The computer readable medium of claim 34 wherein the repositioning step comprises:

37. The computer readable medium of claim 36 wherein obtaining the desired offset value comprises:

38. The computer readable medium of claim 37 wherein obtaining the desired offset value comprises:

39. The computer readable medium of claim 36 wherein obtaining the desired offset value comprises:

40. The computer readable medium of claim 36 wherein

obtaining the desired offset value based on an operator input from a pointing device.

obtaining the desired offset value based on dimensions of the cursor image.

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blending the ancillary image to a display screen
    based on the ALPHA-mask; and
blending the cursor image to the display screen
    based on the cursor AND-mask.

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44. The method of claim 32 wherein the displaying step comprises:

45. The method of claim 32 and further comprising:

softening the ALPHA-mask.

46. The method of claim 45 wherein the softening step comprises:

filtering the ALPHA-mask with an averaging filter
a desired number of times.

47. The method of claim 46 wherein the desired number of times is based on data associated with an image underlying a displayed position of the cursor image.

48. A method of displaying a cursor, comprising:
obtaining a cursor indication indicative of an
alpha blended AGRB image; and
displaying a cursor image based on the cursor
indication.

49. The method of claim 48 wherein obtaining comprises:

obtaining the cursor indication from an application.

50. The method of claim 48 wherein obtaining comprises:

obtaining the cursor indication as indicative of a composite image with per pixel alpha and color values.

51. A display, comprising:
a cursor displayed based on an alpha blended AGRB
image.

a composite image with per pixel alpha and color values.

54. The displayed image of claim 53 wherein the shadow is generated, separately from the cursor, and is based on the cursor.

56. A computer readable medium having instructions stored thereon which, when executed, perform a method comprising:

57. The computer readable medium of claim 56 wherein displaying comprises:

58. The computer readable medium of claim 56 wherein displaying comprises:

obtaining cursor information indicative of the

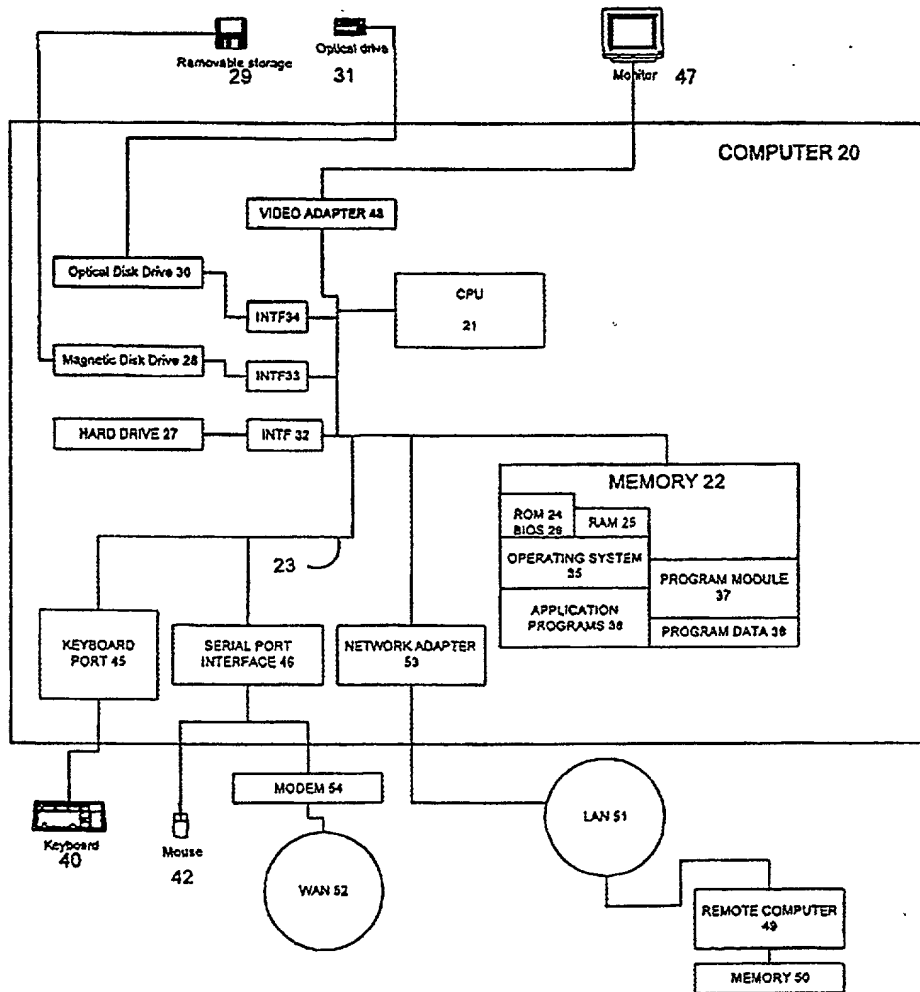
```
cursor;
```

59. A computer rendered display, comprising:
a cursor image, movable in correlation to
actuation of an input device, the cursor
image having a shadow.
60. The computer rendered display of claim 59 wherein
the shadow is generated separately from the cursor
image based on information indicative of the cursor
image.
61. The computer rendered display of claim 59 wherein
the shadow and cursor image are generated
substantially simultaneously.

ABSTRACT OF THE DISCLOSURE

A system and method to display an ancillary image which is movable with a cursor image. A cursor image indication is obtained which is indicative of the cursor image. An ancillary image indication is generated based on the cursor image indication. The cursor image and the ancillary image are displayed based on the cursor image indication and the ancillary image indication.

FIG. 1



000000" SEE 002560

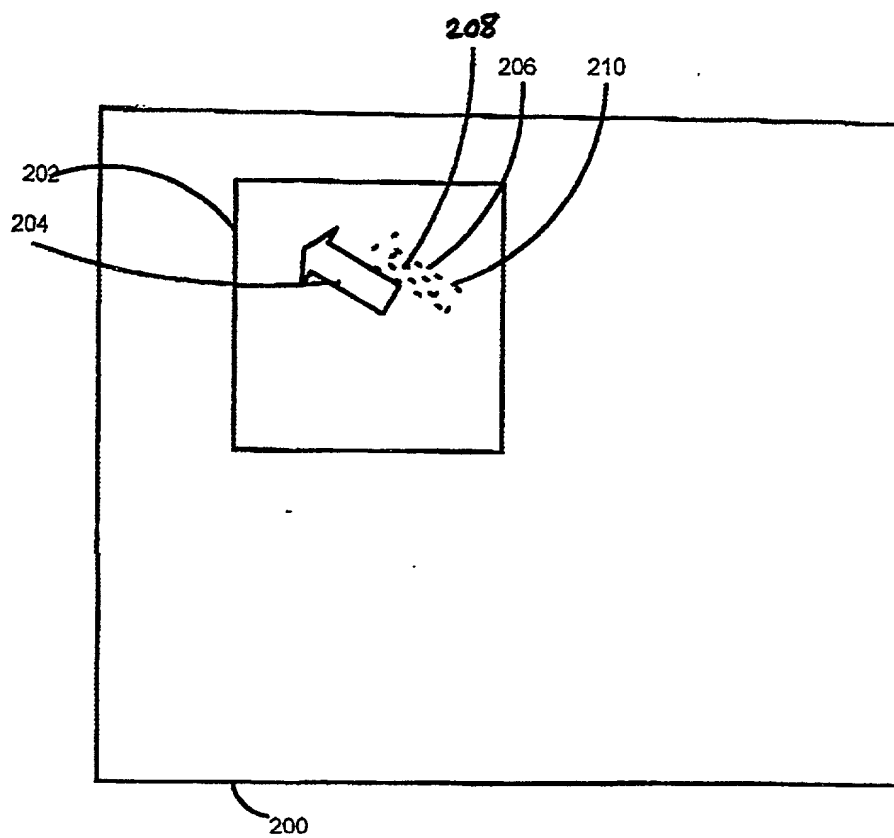
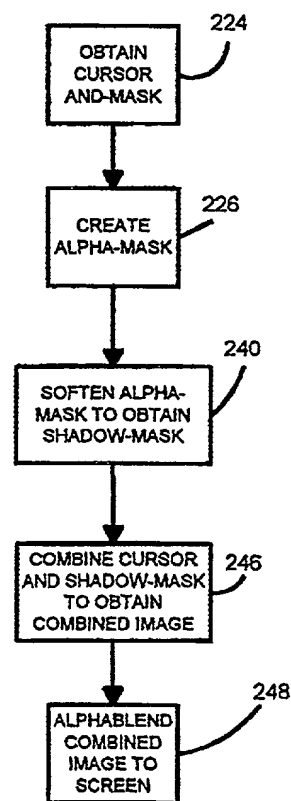
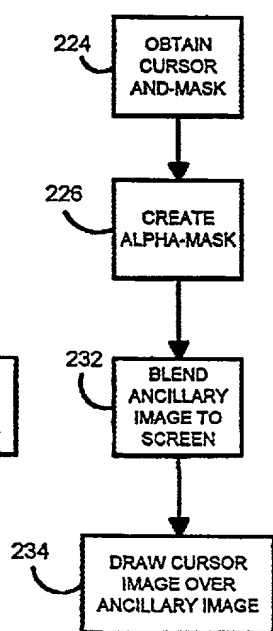
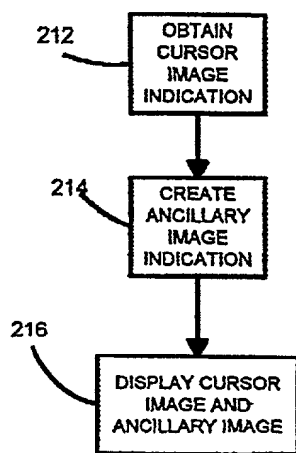


FIG. 2



1. *Chlorophyll a* (Chl *a*)
 2. *Chlorophyll b* (Chl *b*)
 3. *Chlorophyll c* (Chl *c*)
 4. *Chlorophyll d* (Chl *d*)
 5. *Chlorophyll e* (Chl *e*)
 6. *Chlorophyll f* (Chl *f*)
 7. *Chlorophyll g* (Chl *g*)
 8. *Chlorophyll h* (Chl *h*)
 9. *Chlorophyll i* (Chl *i*)
 10. *Chlorophyll j* (Chl *j*)
 11. *Chlorophyll k* (Chl *k*)
 12. *Chlorophyll l* (Chl *l*)
 13. *Chlorophyll m* (Chl *m*)
 14. *Chlorophyll n* (Chl *n*)
 15. *Chlorophyll o* (Chl *o*)
 16. *Chlorophyll p* (Chl *p*)
 17. *Chlorophyll q* (Chl *q*)
 18. *Chlorophyll r* (Chl *r*)
 19. *Chlorophyll s* (Chl *s*)
 20. *Chlorophyll t* (Chl *t*)
 21. *Chlorophyll u* (Chl *u*)
 22. *Chlorophyll v* (Chl *v*)
 23. *Chlorophyll w* (Chl *w*)
 24. *Chlorophyll x* (Chl *x*)
 25. *Chlorophyll y* (Chl *y*)
 26. *Chlorophyll z* (Chl *z*)
 27. *Chlorophyll aa* (Chl *aa*)
 28. *Chlorophyll ab* (Chl *ab*)
 29. *Chlorophyll ac* (Chl *ac*)
 30. *Chlorophyll ad* (Chl *ad*)
 31. *Chlorophyll ae* (Chl *ae*)
 32. *Chlorophyll af* (Chl *af*)
 33. *Chlorophyll ag* (Chl *ag*)
 34. *Chlorophyll ah* (Chl *ah*)
 35. *Chlorophyll ai* (Chl *ai*)
 36. *Chlorophyll aj* (Chl *aj*)
 37. *Chlorophyll ak* (Chl *ak*)
 38. *Chlorophyll al* (Chl *al*)
 39. *Chlorophyll am* (Chl *am*)
 40. *Chlorophyll an* (Chl *an*)
 41. *Chlorophyll ao* (Chl *ao*)
 42. *Chlorophyll ap* (Chl *ap*)
 43. *Chlorophyll aq* (Chl *aq*)
 44. *Chlorophyll ar* (Chl *ar*)
 45. *Chlorophyll as* (Chl *as*)
 46. *Chlorophyll at* (Chl *at*)
 47. *Chlorophyll au* (Chl *au*)
 48. *Chlorophyll av* (Chl *av*)
 49. *Chlorophyll aw* (Chl *aw*)
 50. *Chlorophyll ax* (Chl *ax*)
 51. *Chlorophyll ay* (Chl *ay*)
 52. *Chlorophyll az* (Chl *az*)
 53. *Chlorophyll ba* (Chl *ba*)
 54. *Chlorophyll bb* (Chl *bb*)
 55. *Chlorophyll bc* (Chl *bc*)
 56. *Chlorophyll bd* (Chl *bd*)
 57. *Chlorophyll be* (Chl *be*)
 58. *Chlorophyll bf* (Chl *bf*)
 59. *Chlorophyll bg* (Chl *bg*)
 60. *Chlorophyll bh* (Chl *bh*)
 61. *Chlorophyll bi* (Chl *bi*)
 62. *Chlorophyll bj* (Chl *bj*)
 63. *Chlorophyll bk* (Chl *bk*)
 64. *Chlorophyll bl* (Chl *bl*)
 65. *Chlorophyll bm* (Chl *bm*)
 66. *Chlorophyll bn* (Chl *bn*)
 67. *Chlorophyll bo* (Chl *bo*)
 68. *Chlorophyll bp* (Chl *bp*)
 69. *Chlorophyll bq* (Chl *bq*)
 70. *Chlorophyll br* (Chl *br*)
 71. *Chlorophyll bs* (Chl *bs*)
 72. *Chlorophyll bt* (Chl *bt*)
 73. *Chlorophyll bu* (Chl *bu*)
 74. *Chlorophyll bv* (Chl *bv*)
 75. *Chlorophyll bw* (Chl *bw*)
 76. *Chlorophyll bx* (Chl *bx*)
 77. *Chlorophyll by* (Chl *by*)
 78. *Chlorophyll bz* (Chl *bz*)
 79. *Chlorophyll ca* (Chl *ca*)
 80. *Chlorophyll cb* (Chl *cb*)
 81. *Chlorophyll cc* (Chl *cc*)
 82. *Chlorophyll cd* (Chl *cd*)
 83. *Chlorophyll ce* (Chl *ce*)
 84. *Chlorophyll cf* (Chl *cf*)
 85. *Chlorophyll cg* (Chl *cg*)
 86. *Chlorophyll ch* (Chl *ch*)
 87. *Chlorophyll ci* (Chl *ci*)
 88. *Chlorophyll cj* (Chl *cj*)
 89. *Chlorophyll ck* (Chl *ck*)
 90. *Chlorophyll cl* (Chl *cl*)
 91. *Chlorophyll cm* (Chl *cm*)
 92. *Chlorophyll cn* (Chl *cn*)
 93. *Chlorophyll co* (Chl *co*)
 94. *Chlorophyll cp* (Chl *cp*)
 95. *Chlorophyll cq* (Chl *cq*)
 96. *Chlorophyll cr* (Chl *cr*)
 97. *Chlorophyll cs* (Chl *cs*)
 98. *Chlorophyll ct* (Chl *ct*)
 99. *Chlorophyll cu* (Chl *cu*)
 100. *Chlorophyll cv* (Chl *cv*)
 101. *Chlorophyll cw* (Chl *cw*)
 102. *Chlorophyll cx* (Chl *cx*)
 103. *Chlorophyll cy* (Chl *cy*)
 104. *Chlorophyll cz* (Chl *cz*)
 105. *Chlorophyll da* (Chl *da*)
 106. *Chlorophyll db* (Chl *db*)
 107. *Chlorophyll dc* (Chl *dc*)
 108. *Chlorophyll dd* (Chl *dd*)
 109. *Chlorophyll de* (Chl *de*)
 110. *Chlorophyll df* (Chl *df*)
 111. *Chlorophyll dg* (Chl *dg*)
 112. *Chlorophyll dh* (Chl *dh*)
 113. *Chlorophyll di* (Chl *di*)
 114. *Chlorophyll dj* (Chl *dj*)
 115. *Chlorophyll dk* (Chl *dk*)
 116. *Chlorophyll dl* (Chl *dl*)
 117. *Chlorophyll dm* (Chl *dm*)
 118. *Chlorophyll dn* (Chl *dn*)
 119. *Chlorophyll do* (Chl *do*)
 120. *Chlorophyll dp* (Chl *dp*)
 121. *Chlorophyll dq* (Chl *dq*)
 122. *Chlorophyll dr* (Chl *dr*)
 123. *Chlorophyll ds* (Chl *ds*)
 124. *Chlorophyll dt* (Chl *dt*)
 125. *Chlorophyll du* (Chl *du*)
 126. *Chlorophyll dv* (Chl *dv*)
 127. *Chlorophyll dw* (Chl *dw*)
 128. *Chlorophyll dx* (Chl *dx*)
 129. *Chlorophyll dy* (Chl *dy*)
 130. *Chlorophyll dz* (Chl *dz*)
 131. *Chlorophyll ea* (Chl *ea*)
 132. *Chlorophyll eb* (Chl *eb*)
 133. *Chlorophyll ec* (Chl *ec*)
 134. *Chlorophyll ed* (Chl *ed*)
 135. *Chlorophyll ee* (Chl *ee*)
 136. *Chlorophyll ef* (Chl *ef*)
 1

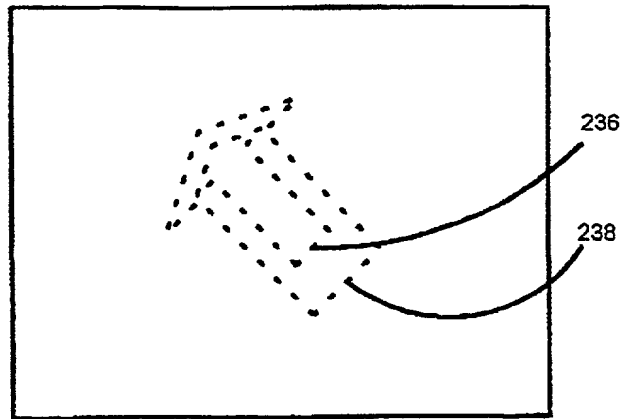


FIG. 5B

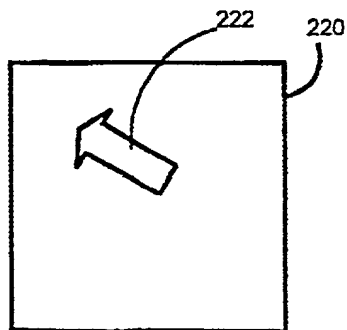


FIG. 4B

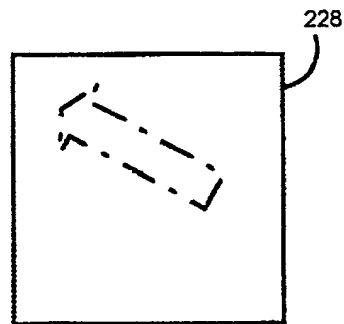


FIG. 4C

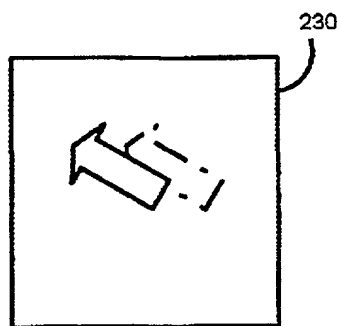


FIG 4D

```

graph TD
    298[ENLARGE CURSOR AND-MASK TO CREATE BORDER TO COMPENSATE FOR LOSS OF DATA AT EDGE OF DISPLAY] --> 304[TRANSLATE AND-MASK 1 VALUES TO 0 AND AND-MASK 0 VALUES TO A NON-ZERO VALUE]
    304 --> 306[OBTAIN OFFSET VALUE]
    306 --> 308[SHIFT TRANSLATED AND-MASK IMAGE BY OFFSET VALUE TO RELOCATE ANCILLARY IMAGE TO DESIRED POSITION (OBTAIN ALPHA-MASK)]
    308 --> 310[FILTER SHIFTED AND-MASK (ALPHA-MASK) A DESIRED NUMBER OF TIMES TO OBTAIN SHADOW-MASK]
  
```

```

graph TD
    320[PERFORM SRCAND OF CURSOR AND MASK INTO SHADOW-MASK] --> 322[SET ALPHA VALUES OF CURSOR PIXELS TO 1]
    322 --> 324[PERFORM SRCPAINT OF CURSOR IMAGE INTO SHADOW-MASK]

```

FIG. 7

Diagram illustrating a second embodiment of a device. It features a rectangular frame (244) containing a solid arrow (242) pointing upwards and to the left, and a dashed arrow (236) pointing upwards and to the right. A curved line (238) is positioned between the two arrows.

A diagram showing a central component labeled 300, which is a square containing a stylized arrow pointing towards the top-left. This component is connected by a curved line to a larger rectangular box labeled 302, representing a system or network.

FIG. 6B

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2
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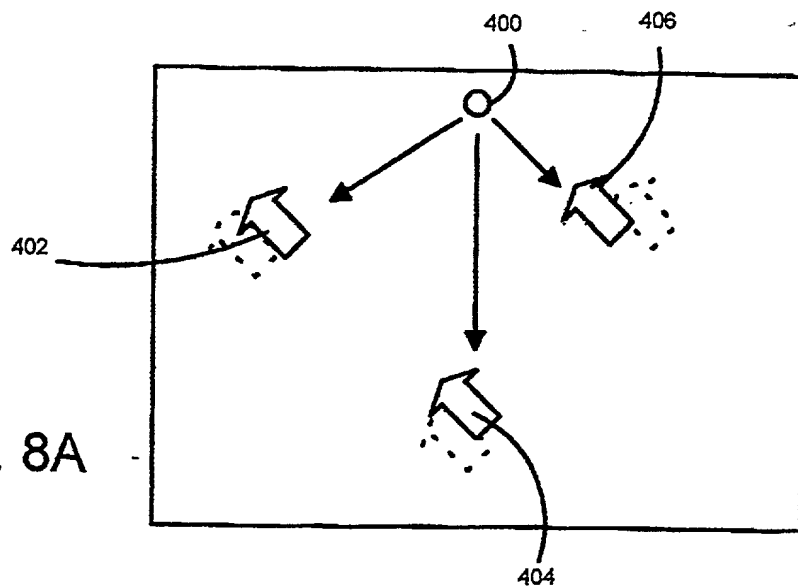


FIG. 8A

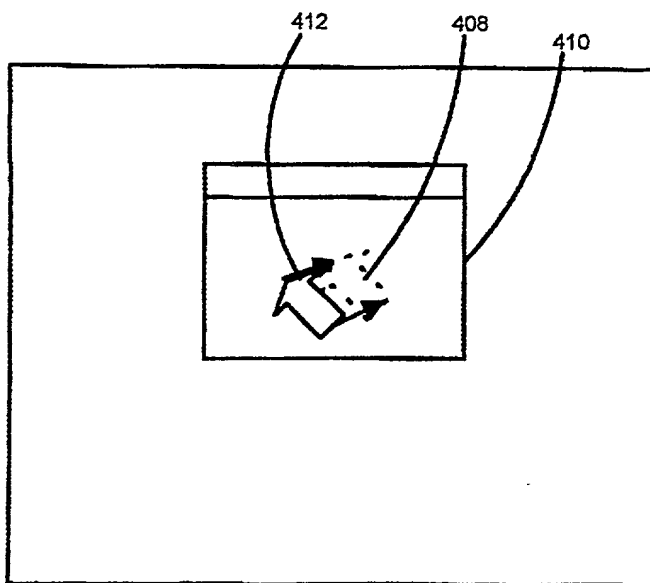


FIG. 8B

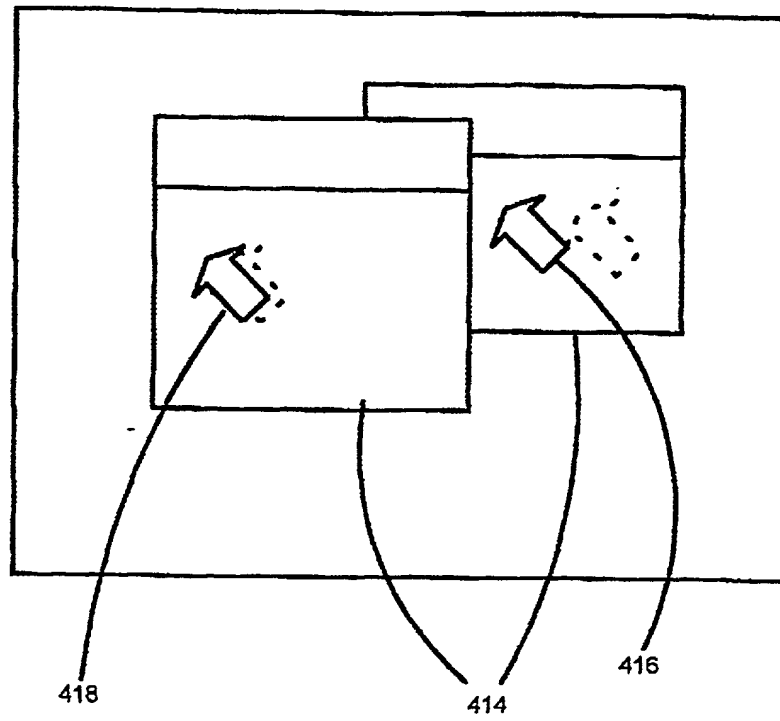
[illegible]

FIG. 8C

**COMBINED DECLARATION AND
POWER OF ATTORNEY
IN ORIGINAL APPLICATION**

Attorney Docket No.

M61.12-0177

SPECIFICATION AND INVENTORSHIP IDENTIFICATION

As a below named inventor, we declare that:

Our residence, post office address and citizenship are as stated below next to our name.

We believe we are the original, first and joint inventor of the subject matter which is claimed, and for which a patent is sought, on the invention entitled SYSTEM AND METHOD FOR IMPLEMENTING AN IMAGE ANCILLARY TO A CURSOR the specification of which,

(check one) X is attached hereto.

— was filed on as Appln. Serial No..

— and was amended on.

— was described and claimed in PCT International Application No. filed on and as amended under PCT Article 19 on.

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

We have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. We acknowledge the duty to disclose information which is known to me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

PRIORITY CLAIM (35 USC § 119)

We claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Number	Country	Day/Month/Year Filed	Priority Claimed
_____	_____	_____	Yes _____ No
_____	_____	_____	Yes _____ No

PRIORITY CLAIM (35 USC § 120)

We claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below. Insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 United States Code § 112, we acknowledge the duty to disclose to the Patent Office all information known to me to be material to patentability as defined in Title 37 Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Appln. Ser. No.	U.S. Serial No. (if any under PCT)	Filing Date	Status
60/138433		June 10, 1999	Pending

DECLARATION

We declare that all statements made herein that are of our own knowledge are true and that all statements that are made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY

We appoint the following attorneys and agents to prosecute the patent application identified above and to transact all business in the Patent and Trademark Office connected therewith, including full power of association, substitution and revocation: Judson K. Champlin, Reg. No. 34,797; Joseph R. Kelly, Reg. No. 34,847; Nickolas E. Westman, Reg. No. 20,147; Steven M. Koehler, Reg. No. 36,188; David D. Brush, Reg. No. 34,557; John D. Veldhuis-Kroeze, Reg. No. 38,354; Deirdre Megley Kvale, Reg. No. 35,612; Theodore M. Magee, Reg. No. 39,758; Peter S. Dardi, Reg. No. 39,650; Christopher R. Christenson, Reg. No. 42,413; John A. Wiberg, Reg. No. 44,401; Brian D. Kaul, Reg. No. 41,885; Katie E. Sako, Reg. No. 32,628 and Daniel D. Crouse, Reg. No. 32,022.

We ratify all prior actions taken by Westman, Champlin & Kelly, P.A. or the attorneys and agents mentioned above in connection with the prosecution of the above-mentioned patent application.

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